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QUERY CONTROL FORM				RTIS USE ONLY	
Application No.	10/091,204	Prepared by	NPB	Tracking Number	05885310
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JACKET			
a. Serial No.	f. Foreign Priority	k. Print Claim(s)	p. PTO-1449
b. Applicant(s)	g. Disclaimer	l. Print Fig.	q. PTOL-85b
c. Continuing Data	h. Microfiche Appendix	m. Searched Column	r. Abstract
d. PCT	i. Title	n. PTO-270/328	s. Sheets/Figs
e. Domestic Priority	j. Claims Allowed	o. PTO-892	t. Other

SPECIFICATION

a. Page Missing
b. Text Continuity
c. Holes through Data
d. Other Missing Text
e. Illegible Text
f. Duplicate Text
g. Brief Description
h. Sequence Listing
i. Appendix
j. Amendments
k. Other

CLAIMS

a. Claim(s) Missing
b. Improper Dependency
c. Duplicate Numbers
d. Incorrect Numbering
e. Index Disagrees
f. Punctuation
g. Amendments
h. Bracketing
i. Missing Text
j. Duplicate Text
k. Other

MESSAGE

On Page 2 and 3 of Amendment filed/dated 9/15/03, last 2 lines are illegible. Please provide missing data.

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MMC 4/13/04

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RESPONSE Entire last amendment provided. Last 2 lines are now legible.

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Amendments to the Claims:

1. (original) A liquid crystal display device comprising:

a fluorescent light tube as a light source, and

a liquid crystal display panel for displaying images by controlling transmission of light from said fluorescent light tube;

said liquid crystal display panel including:

a color filter substrate having color filter layers of red, green and blue,

an opposing substrate opposed to said color filter substrate, and

a liquid crystal material being filled between said opposing substrate and said color filter substrate;

wherein said fluorescent light tube includes a phosphor having luminous efficiency equivalent to 80% and below in comparison with $LaPO_4$:Ce,Tb as a green phosphor,

a maximum peak of a radiant energy spectrum of said phosphor is included within a spectral transmissive region of said green color filter layer,

said radiant energy spectrum of said phosphor increases virtually continuously concerning points other than said maximum peak within a wavelength region where spectral transmissive regions of said blue and said green color filter layers overlap, and

said fluorescent light tube and said color filter layers have a relation such that a color reproduction region of light emitted from said fluorescent light tube through said color filter layers has an NTSC ratio of 85% or higher.

2. (original) The liquid crystal display device according to claim 1, wherein said radiant energy spectrum of said green phosphor decreases virtually continuously concerning points other than said maximum peak within a wavelength region where spectral transmissive regions of said green color filter layer and said red color filter layer overlap.

3. (original) The liquid crystal display device according to claim 1, wherein a wavelength of said maximum peak of the radiant energy spectrum of said green phosphor is included within a wavelength region having transmittance of 90% or higher of maximum transmittance of said green color filter layer.

4. (original) The liquid crystal display device according to claim 1,

wherein maximum transmittance of light of said green color filter layer is 55% or higher, and

maximum transmittance of light of said blue color filter layer is 40% or higher.

5. (currently amended) A liquid crystal display device comprising a backlight unit and a liquid crystal display panel for displaying images by controlling transmission of light from said backlight unit,

wherein said liquid crystal display panel includes:

a color filter substrate having color filter layers of red, green and blue,

an opposing substrate that opposes to said color filter substrate, and

a liquid crystal material being filled between said opposing substrate and said color filter substrate; and

said backlight unit includes:

a plurality of cold cathode tubes being disposed on a back surface of said liquid crystal display panel and having any one of Zn_2SiO_4:Mn and 3(Ba,Mg,Eu,Mn)0.8Al_2O_3 as a green phosphor, and

a diffusion plate being disposed between said plurality of cold cathode tubes and said liquid crystal display panel, said diffusion plate being for diffusing light from said plurality of cold cathode tubes;

<u>wherein said plurality of cold cathode tubes and said color filter layers have a relation in that a color reproduction region of light emitted from said plurality of cold cathode tubes through said color filter layers has an NTSC ratio of 85% or higher</u>.

6. (canceled)

7. (original) The liquid crystal display device according to claim 1, wherein said radiant energy spectrum of said green phosphor has a value equivalent to 20% or lower of a maximum peak value of a radiant energy spectrum of a blue phosphor being coated inside said fluorescent tube at a wavelength where spectral transmittance curves of said blue and said green color filter layers intersect.

8. (original) The liquid crystal display device according to claim 7, wherein a wavelength of said maximum peak of the radiant energy spectrum of said green phosphor is included within a wavelength region having transmittance of 90% or higher of maximum transmittance of said green color filter layer.

9. (original) A display device comprising:

a tri-phospher fluorescent light tube including three kinds of phosphors respectively radiating blue, green and red light, said tri-phospher fluorescent light tube having luminous efficiency equivalent to 90% or lower of luminous efficiency of a tri-phospher fluorescent light tube including $BaMg_2Al_{16}O_{27}$:Eu, $LaPO_4$:Ce,Tb and Y_2O_3:Eu as phosphors thereof,

optical elements for controlling transmission of light from said tri-phospher fluorescent light tube, and

a substrate including color filter layers of red, green and blue;

wherein a radiant energy of said tri-phospher fluorescent light tube is equivalent to 50% or lower of a maximum peak of a radiant energy of said blue phosphor at a wavelength where spectral transmittance curves of said blue and said green color filter layers intersect, and

said tri-phospher fluorescent light tube and said color filter layers have a relation such that a color reproduction region of light emitted from said tri-phospher fluorescent light tube through said color filter layers has an NTSC ratio of 85% or higher.

10. (original) The display device according to claim 9, wherein said fluorescent light tube includes any one of Zn_2SiO_4:Mn and 3(Ba,Mg,Eu,Mn)0.8Al_2O_3 as a green phosphor.

11. (original) The display device according to claim 10, wherein said color reproduction region of the light emitted via said color filter layers has an NTSC ratio of 100% or higher.

12. (original) The display device according to claim 10, wherein a wavelength of said maximum peak of the radiant energy spectrum of said green phosphor is included within a wavelength region having transmittance of 90% or higher of maximum transmittance of said green color filter layer.

13. (original) The display device according to claim 10,

wherein maximum transmittance of light of said green color filter layer is 55% or higher, and

maximum transmittance of light of said blue color filter layer is 40% or higher.

14. (original) The display device according to claim 10,

wherein said display device includes a liquid crystal display panel having:

a first transparent substrate,

a second transparent substrate, and

a liquid crystal material as said optical elements, said liquid crystal material being filled between said first transparent substrate and said second transparent substrate; and

said liquid crystal display panel includes:

said color filter layers, and

a plurality of pixel electrodes for applying electric fields to said liquid crystal material, said plurality of pixel electrodes being transparent electrodes that are arranged in a matrix layout with said color filter layers.

REMARKS

Applicants respectfully request reconsideration of the Office Action mailed May 7, 2003. Claims 1-5 and 7-14 are presented for examination. Claim 6 has been canceled, and Claim 5 has been amended to incorporate the limitation of Claim 6. No new matter has been added.

Rejection of Claims 1-4 and 9-14 under 35 U.S.C. § 103(a) over Kobayashi et al.

Claims 1-4 and 9-14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,757,447 to Kobayashi et al. Applicants respectfully traverse this rejection.

The present invention is directed to a display device, specifically a liquid crystal display device, which comprises a color filter substrate having color filter layers of red, green and blue, and a flourescent light tube or backlight unit as a light source. It is a feature of this invention that the flourescent light tube and the color filter layers have a relation such that a color reproduction region of light emitted from the flourescent light tube through the color filter layers has an NTSC ratio of 85% or higher. Applicants respectfully submit that this feature (at least) is neither disclosed nor suggested by Kobayashi et al.

The Kobayashi et al. patent is directed to a flourescent lamp for a color liquid crystal display device. In Figure 1, Kobayashi et al. describe a conventional flourescent lamp wherein Y_2O_3:Eu is used as the red-light emitting phosphor, $LaPO_4$:Ce,Tb is used as the green-light emitting phosphor, and $BaMg_2Al_{16}O_{27}$:Eu is used as the blue-light emitting phosphor (col. 1, line 66 – col. 2, line 10). This is the same conventional tri-phosphor flourescent light tube which is discussed in the present application at page 3, lines 22-23. As discussed in the present application, use of this conventional flourescent light tube in a liquid crystal display device does not result in an NTSC ratio of 85% or higher.

Kobayashi further discloses a "new" flourescent lamp wherein $M_3(PO_4)$:Sn,Mn is used as the red light emitting phosphor, where M is at least one of Sr, Mg, Ba, Ca, Zn and Ga (col. 6, lines 52-57). Each of the phosphors used in the Kobayashi flourescent lamp are characterized by having a half value width of the light emitting peak wavelength in a range of 30 nm - 100 nm, thereby preventing the fringes which are caused by the interference of lights. However, use of the above tin-manganese-added activated orthophosphate phosphor as the red light emitting phosphor would result in an NTSC ratio which is even lower than the ratio obtained when the conventional flourescent light tube is used. Therefore, Kobayashi et al. fail to disclose, and actually teach away from, a display device wherein the flourescent light tube and the color filter layers have a relation such that a color reproduction region of light emitted from the flourescent light tube through the color filter layers has an NTSC ratio of 85% or higher.

Accordingly, Applicants respectfully submit that Claims 1-4 and 9-14 are patentable over Kobayashi et al., and therefore request withdrawal of this rejection.

Rejection of Claims 5-8 under 35 U.S.C. § 103(a) over Kobayashi et al. in view of Kawamura

Claims 5-8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kobayashi et al. in view of U.S. Patent No. 4,945,350 to Kawamura. Applicants respectfully traverse this rejection.

As discussed previously, it is a feature of the present invention that the cold cathode tubes and the color filter layers have a relation such that a color reproduction region of light emitted from the cold cathode tubes through the color filter layers has an NTSC ratio of 85% or higher. Applicants respectfully submit that this feature (at least) is neither disclosed nor suggested by Kobayashi et al. in view of Kawamura.